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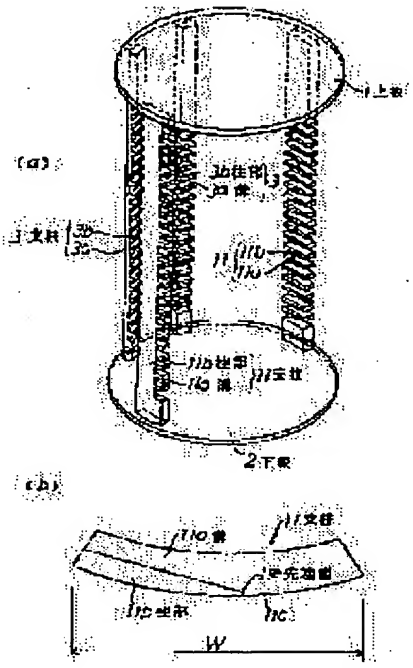
(54) JIG FOR SEMICONDUCTOR HEAT TREATMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent deformation under high temperature, to have strength corresponding to an automatic carriage system and a large-diameter wafer, and to prevent the generation of slip on the wafer during the heat oxidation and diffusion treatment of the wafer. .
SOLUTION: A jig is provided with an upper plate 1, a lower plate 2 and struts 3 and 11 for linking these plates, the wafer is held by a plurality of grooves 3a and 11a provided on the struts 3 and 11 and among the struts 3 and 11, at least the struts 11 for holding both sides are formed wider. Then, the thickness of the wider struts 11 at positions closer to the central parts of pillar parts 11b by 1.0mm from top end faces 11e of the pillar parts 11b is made not thinned than 0.7mm by curring or tilting the top end faces 11e of the pillar parts 11b at an angle more than 45° , notching the sections of pillar parts 11e including the top end faces 11e, or expanding the top end faces 11e of the pillar parts 11b.



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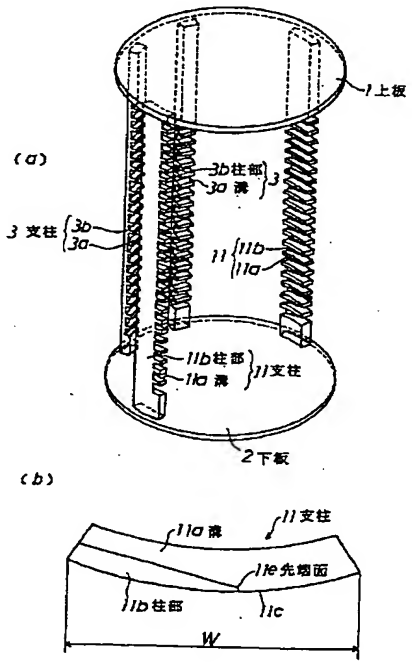
(54)【発明の名称】　半導体熱処理用治具

(57)【要約】

【課題】　高温下で変形することがなく、自動搬送システム及び大口径のウェハーに対応した強度を有し、ウェハーの熱酸化・拡散処理中にウェハーにスリップを生成させない。

【解決手段】　上板１及び下板２とこれらを連結する支柱３，１１を備え、支柱３，１１に設けた複数の溝３ａ，１１ａでウェハーを支持し、かつ、支柱３，１１のうち少なくとも両サイドを支持する支柱１１を広幅とした半導体熱処理用治具において、前記広幅の支柱１１における柱部１１ｂの先端面１１ｅから１．０ｍｍだけ柱部１１ｂの中央部寄りの位置における厚みを、柱部１１ｂの先端面１１ｅを湾曲状又は４５°以上の角度となるようにしたり、また、柱部１１ｂの先端面１１ｅを含む部分を切り欠いたり、また、柱部１１ｂの先端面１１ｅを張り出させたりすることで、０．７ｍｍ以上としている。



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【特許請求の範囲】

【請求項１】　上板及び下板とこれらを連結する支柱を備え、支柱に設けた複数の溝でウェハーを支持し、かつ、支柱のうち少なくとも両サイドを支持する支柱を広幅とした半導体熱処理用治具において、前記広幅の支柱における柱部の端から１．０ｍｍだけ柱部の中央部寄りの位置における厚みを０．７ｍｍ以上としたことを特徴とする半導体熱処理用治具。

【請求項２】　広幅の支柱における柱部の端を湾曲状又は４５°以上の角度となるようにしたことを特徴とする請求項１記載の半導体熱処理用治具。

【請求項３】　広幅の支柱における柱部の端を含む部分を切り欠いたことを特徴とする請求項１記載の半導体熱処理用治具。

【請求項４】　広幅の支柱における柱部の端を張り出させたことを特徴とする請求項１記載の半導体熱処理用治具。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、シリコンウェハーの保持治具に係り、特に熱酸化・拡散処理等に使用されるウェハーボート等の炭化珪素質の半導体熱処理用治具に関するものである。

【０００２】

【従来の技術】半導体の製造プロセスにおいて、ウェハーにドープした微量不純物を拡散させる工程や、表面に酸化膜を付与する工程では、電気炉内で複数枚のウェハーを保持するための半導体熱処理用治具が用いられる。この半導体熱処理用治具は、従来は、図５に示すように、上板１と下板２を４本の支柱３で連結したもので、これら支柱３に刻設された複数の溝３ａでウェハーを支持する構成である。

【０００３】このような半導体熱処理用治具では、ウェハーは、支柱３の溝３ａに水平に挿入したり、引き出したりするので、治具の前面には支柱３を設置することはできない。従って、図５に示すような、４本の支柱３が全て同じ狭幅の場合には、ウェハーを均等に支持することが難しく、また、ウェハー支持部（溝３ａ）に作用する荷重が大きくなる。なお、図５中の３ｂは支柱３の柱部を示す。

【０００４】近年の半導体プロセスの進歩に伴って、６インチから８インチ，１２インチへとウェハーの大口径化が進み、ウェハーの自重が増大しているにも係わらず、ウェハーの厚みはさほど増加しておらず、強度低下の問題が指摘されている。特に、１１００℃以上の高温処理においては、このウェハー支持部の荷重のためにウェハーの支持部にスリップ（結晶転位による結晶欠陥）が発生し、半導体デバイスの不良の一因となっている。

【０００５】一方、スリップを抑制する半導体熱処理用治具として、特開平５－１１４６４５号や特開平６－１

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６３４４０号のように、ウェハーの外周をサポートするリング状等の支持板を用いたものが提案されている。しかし、これらで提案された半導体熱処理用治具では、本来は余分な支持板をウェハーと同一枚数必要とするので、治具の重量が増加して熱処理装置の負担が増大するとともに、熱応答性が低下するという問題がある。また、支持板の厚みのために同一寸法の治具でも積載支持が可能なウェハー枚数が減少し、生産性が悪くなるという問題もある。

【０００６】そこで、両者の問題点を解決可能な半導体熱処理用治具として、図６に示すような、特に両サイドを支持する支柱を広幅にし、ウェハー支持部の荷重を分散させるものが開発され、使用されるようになってきている。

【０００７】

【発明が解決しようとする課題】しかしながら、図６に示すような広幅の支柱４を有する半導体熱処理用治具は、図７に示すように、柱部４ｂの端が極めて鋭い角度となっているので、溝４ａを加工する時にこの尖った部分４ｂａがチッピング等により欠けたり、熱処理時、支柱４に応力が作用した際に破壊起点となるという問題があった。

【０００８】本発明は、上記した従来の問題点に鑑みてなされたものであり、高温下で変形することがなく、自動搬送システム及び大口径のウェハーに対応した強度を有し、ウェハーの熱酸化・拡散処理中にウェハーにスリップを生成することがない半導体熱処理用治具を提供することを目的としている。

【０００９】

【課題を解決するための手段】上記した目的を達成するために、本発明の半導体熱処理用治具では、少なくとも両サイドを支持する支柱を広幅とした半導体熱処理用治具の、前記広幅の支柱における柱部の端から１．０ｍｍだけ柱部の中央部寄りの位置における厚みを０．７ｍｍ以上としているのである。そして、この厚みを確保することで、大口径のウェハーに対応した強度を有しつつ、ウェハーの熱酸化・拡散処理中にウェハーにスリップを生成させることがなく、また、溝加工時にチッピング等により柱部の端が欠けることもない。

【００１０】

【発明の実施の形態】本発明の半導体熱処理用治具は、上板及び下板とこれらを連結する支柱を備え、支柱に設けた複数の溝でウェハーを支持し、かつ、支柱のうち少なくとも両サイドを支持する支柱を広幅とした半導体熱処理用治具において、前記広幅の支柱における柱部の端から１．０ｍｍだけ柱部の中央部寄りの位置における厚みを０．７ｍｍ以上としているのであり、その具体的手段として、広幅の支柱における柱部の端を湾曲状又は４５°以上の角度となるようにしたり、また、広幅の支柱における柱部の端を含む部分を切り欠いたり、また、広

幅の支柱における柱部の端を張り出させたりするのである。

【００１１】本発明の半導体熱処理用治具において、「柱部の端から１．０ｍｍだけ柱部の中央部寄りの位置」とは、以下に述べる位置をいう。

① 図２（ａ），（ｃ）のように、柱部１１ｂの先端面１１ｅと、この先端面１１ｅの延長線が支柱１１の外周面１１ｃと交差する位置１１ｄがほぼ同じ位置の場合には、前記位置１１ｄにおける外周面１１ｃの接線１２上の、位置１１ｄから１．０ｍｍだけ柱部１１ｂの中央部寄りの位置をいう。

【００１２】② 図２（ｂ），（ｄ）のように、柱部１１ｂの先端面１１ｅと、この先端面１１ｅの延長線が支柱１１の外周面１１ｃと交差する位置１１ｄが異なる場合には、前記先端面１１ｅから外周面１１ｃに下ろす線１３を、この線１３と外周面１１ｃとの交点１４における接線１２とのなす角αとβが同一となるように下ろし、前記交点１４における外周面１１ｃの接線１２上の、前記交点１４から１．０ｍｍだけ柱部１１ｂの中央部寄りの位置をいう。

【００１３】③ 図３に示すように、柱部１１ｂの先端面１１ｅが前記した線１３と合致する場合には、この先端面１１ｅから１．０ｍｍだけ柱部の中央部寄りの位置をいう。なお、図４に示すように、広幅の支柱１１における柱部１１ｂの端を張り出したものでは、前記した①～③のうちの該当する方法によって求めた位置をいう。

【００１４】また、本発明の半導体熱処理用治具において、柱部の端から１．０ｍｍだけ柱部の中央部寄りの位置における厚みｔを０．７ｍｍ以上としているのは、本発明者の実験によれば、０．７ｍｍ未満であれば、溝を加工する際のチッピングやハンドリング時に柱部の端が欠けるからである。なお、柱部の端が欠けると、その部分を破壊起点として亀裂が進展し、最終的には支柱全体が折れてしまう結果となる。

【００１５】溝を加工する際における柱部の欠けを防止する観点からすると、前記した厚みｔは大きければ大きいほど良いが、厚みｔが大きくなりすぎると支柱ひいては半導体熱処理用治具の重量が増加し、熱処理装置の負担が大きくなったり、熱応答性の低下や熱放射の不均一による温度分布の増大を招くことになる。従って、前記した厚みｔは１０ｍｍ以下とすることが望ましい。

【００１６】なお、本発明の半導体熱処理用治具において、広幅の支柱１１の幅Ｗは特に限定されるものではないが、支柱１１の幅Ｗが支持するウェハーの直径の１／５未満であると、ウェハーの支持が不十分となりウェハーの変形やスリップが起こる可能性があるので、１／５以上とすることが望ましい。また、ウェハーの直径の１／３を超えると、治具の重量増により熱処理装置の負担が大きくなり、また、熱応答性の低下や熱放射の不均一による温度分布の増大を招くので、１／３以下とすることが望ましい。

【００１７】

【実施例】以下、本発明の半導体熱処理用治具を図１～図４に示す実施例に基づいて説明する。図１（ａ）は本発明の半導体熱処理用治具の斜視図、（ｂ）は本発明の半導体熱処理用治具の構成部品である広幅の支柱の横断面図、図２（ａ）～（ｄ）は本発明の半導体熱処理用治具の構成部品である広幅の支柱の異なる実施例の要部横断面図、図３は（ａ）～（ｄ）は本発明の半導体熱処理用治具の構成部品である広幅の支柱のさらに異なる実施例の横断面図、図４（ａ）（ｂ）は本発明の半導体熱処理用治具の構成部品である広幅の支柱のさらに異なる実施例の横断面図を示す。

【００１８】図１において、１は円形状の上板、２は同じく円形状の下板であり、これら上板１と下板２は一側部が開放されるように例えば４本の支柱によって連結されている。そして、この支柱のうち両サイドには、例えば支持するウェハーの直径の１／５以上の幅を有する広幅の支柱１１が配置され、中央（奥）には狭幅の支柱３が配置されている。

【００１９】前記支柱３，１１の内周側には、図１（ａ）に示すように、高さ方向に多数の溝３ａ，１１ａが一定間隔で設けられ、これらの溝３ａ，１１ａでウェハーをそれぞれ支持するようになっている。

【００２０】本発明の半導体熱処理用治具は、上記した広幅の支柱１１における柱部１１ｂの端から１．０ｍｍだけ柱部１１ｂの中央部寄りの位置における厚みｔを０．７ｍｍ以上としているのであり、そのために、図２（ａ）（ｂ）に示すように、広幅の支柱１１における柱部１１ｂの先端面１１ｅを湾曲状にしたり、また、図２（ｃ）（ｄ）に示すように、広幅の支柱１１における柱部１１ｂの先端面１１ｅの角度γを４５°以上となるようにしたり、また、図３に示すように、広幅の支柱１１における柱部１１ｂの先端の尖った部分１１ｇを含む部分を切り欠いたり、また、図４に示すように、広幅の支柱１１における柱部１１ｂの先端を張り出したりするのである。なお、図４中の１１ｆは張出部を示す。

【００２１】ところで、前記した半導体熱処理用治具は、炭化珪素質にて形成されており、例えば上板１，下板２，支柱３及び１１をそれぞれ成形した後これらの各部材を用いて半導体熱処理用治具に組み立て、次に、この半導体熱処理用治具の各部材中にSiを含浸反応焼結させる。そして、このようにして各部材中にSiを含浸反応焼結させた後、各支柱３，１１の溝３ａ，１１ａを加工して製品となす。この溝加工は、支持しようとするウェハーと同じ外径の回転刃を用い、支柱３及び１１が開放された側から回転刃を水平に挿入したり、また、支持しようとするウェハーより小さい外径の回転刃を用い、その軌跡が前記ウェハーと同じ外径の回転刃を挿入した時の軌跡と同じになるように水平に挿入することによって

行う。

【００２２】次に、上記した本発明の半導体熱処理用治具の効果を確認するために行った実験結果について説明する。実験に用いた半導体熱処理用治具は、全て炭化珪素７５重量部、金属シリコン２５重量部からなる炭化珪素質材料で製作され、それぞれ支柱に設けた溝に１５０枚ずつ（上下各２０枚はダミー）、８インチのウェハー（厚み７００μｍ）を支持させた状態で所定の熱処理（１２００℃で２時間加熱：昇温は８℃／分，降温は５＊℃／分，前半の１時間はO₂雰囲気，後半の１時間はN₂雰囲気）を行った。

【００２３】実験の結果を下記表１に示す。なお、表１には、従来例として、図５に示す治具と特開平６－１６３４４０号で提案された治具を、また比較例として図７に示す広幅の支柱を設置した治具を用いた場合の結果も併せて示している。

【００２４】

【表１】

	治具、広幅支柱の形状	t mm	W mm	スリップ
実施例１	図２（a）	１．５	４５	認められず
〃　２	図２（b）	１．５	４５	〃
〃　３	図２（c）	１．５	４５	〃
〃　４	図２（d）	１．５	４５	〃
〃　５	図３（a）	４．０	６５	〃
〃　６	図３（b）	３．２	６０	〃
〃　７	図３（c）	２．１	６５	〃
〃　８	図３（d）	２．８	６０	〃
〃　９	図４（a）	１．２	６０	〃
〃　10	図４（b）	１．２	６５	〃
従来例１	図５	５．０	１５	支柱近傍に多数発生
〃　２	特開平6-163440号	５．０	１５	認められず（注１）
比較例	図７	０．５	６５	実験せず（注２）

（奥部に配置した２本の狭幅支柱の幅は全て１５ｍｍである。）

注１：重量増により熱応答性が低下するとともに、溝間隔の拡大によりウェハーの支持枚数が低下した。

注２：溝加工時に柱部４ｂの先端に割れが発生し、実験せず。

【００２５】表１より明らかなように、本発明の半導体熱処理用治具を使用した場合には、いずれの場合も、支持した１１０枚のウェハーは１枚もスリップが認められなかった。一方、従来例１の場合には支持した１１０枚のウェハーは全て支柱近傍に多数のスリップが発生した。また、従来例２の場合には本発明の半導体熱処理用治具を使用した場合と同様に、支持したウェハーは１枚もスリップが認められなかったが、リング状の支持体を備えているので、重量増により熱応答性が低下するとともに、溝間隔の拡大によりウェハーの支持枚数が本発明の１５０枚から１３０枚に低下した。また、比較例１の場合には、溝加工時に柱部４ｂの先端に割れが発生し、比較例２の場合には、溝加工時に柱部４ｂの先端に割れは発生しなかったものの、炉内設置時に割れが発生したので、実験を行わなかった。

【００２６】

【発明の効果】以上説明したように、本発明の半導体熱処理用治具は、少なくとも両サイドを支持する支柱を広幅とした半導体熱処理用治具の、前記広幅の支柱における柱部の端から１．０ｍｍだけ柱部の中央部寄りの位置における厚みを０．７ｍｍ以上としているので、大口径のウェハーに対応した強度を有しつつ、ウェハーの熱酸化・拡散処理中にウェハーにスリップを生成させることがなく、また、溝加工時にチッピング等により柱部の端が欠けることもない。

【図面の簡単な説明】

【図１】（ａ）は本発明の半導体熱処理用治具の斜視図、（ｂ）は本発明の半導体熱処理用治具の構成部品である広幅の支柱の横断面図である。

【図２】（ａ）～（ｄ）は本発明の半導体熱処理用治具の構成部品である広幅の支柱の異なる実施例の要部横断面図である。

【図３】（ａ）～（ｄ）は本発明の半導体熱処理用治具の構成部品である広幅の支柱のさらに異なる実施例の横断面図である。

【図４】（ａ）（ｂ）は本発明の半導体熱処理用治具の

構成部品である広幅の支柱のさらに異なる実施例の横断面図である。

【図５】（ａ）は従来の半導体熱処理用治具の斜視図、（ｂ）は（ａ）の横断面図である。

【図６】（ａ）は従来の他の半導体熱処理用治具の斜視図、（ｂ）は（ａ）の横断面図である。

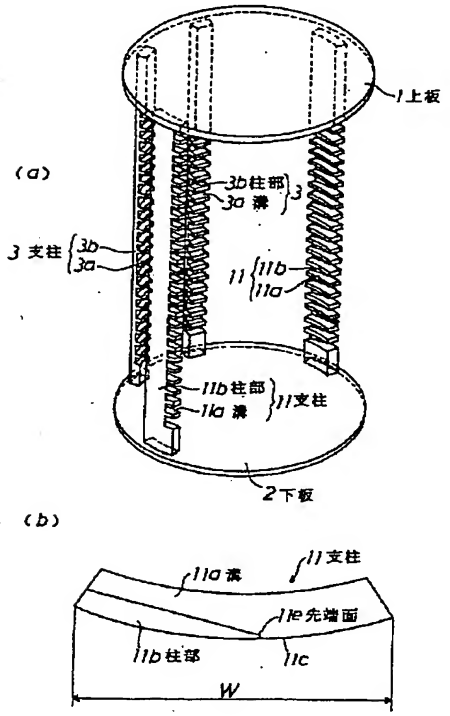
【図７】図６に示す半導体熱処理用治具の構成部品である広幅の支柱の横断面図である。

【符号の説明】

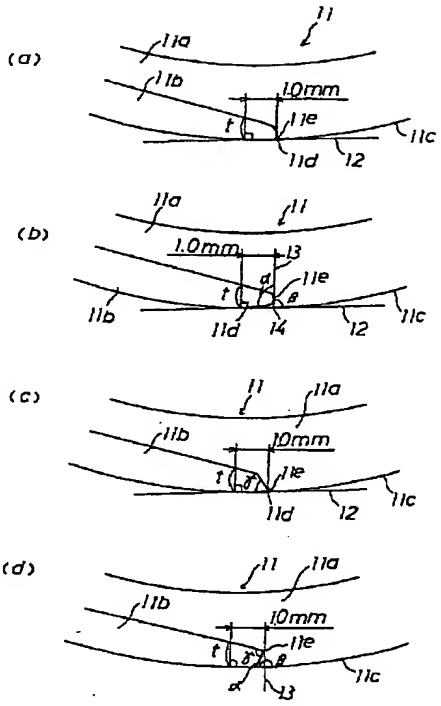
１	上板	＊２	下板
		３	支柱
		３ａ	溝
		３ｂ	柱部
		１１	支柱
		１１ａ	溝
		１１ｂ	柱部
		１１ｅ	先端面
		１１ｆ	張出部

＊10

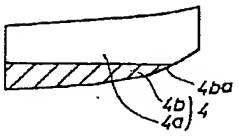
【図１】



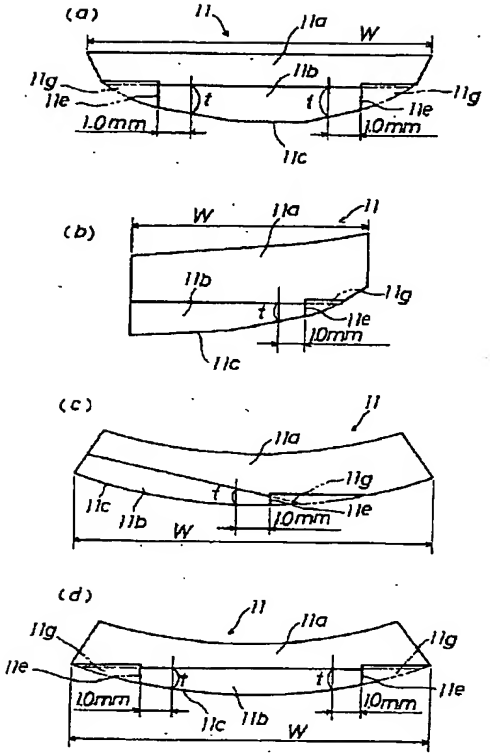
【図２】



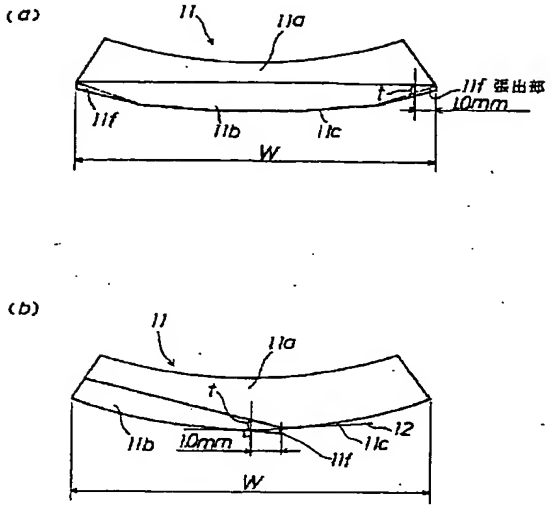
【図７】



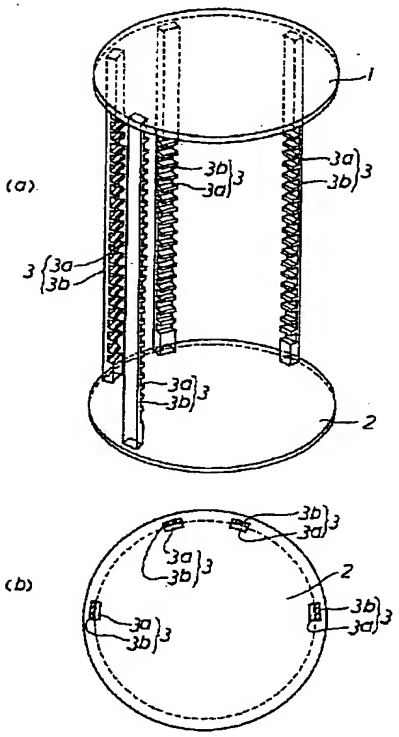
【図３】


(a)
11
11a
W
11b
11g
11e
t
1.0mm
11c
(b)
(c)
(d)

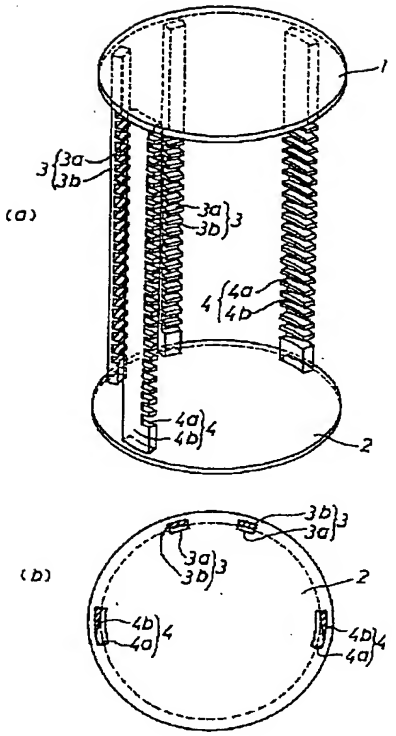
【図４】


(a)
11
11a
11f 張出部
10mm
11b
11c
W
(b)
12

【図５】


(a)
1
3a
3b
3
2
(b)

【図６】



PATENT ABSTRACTS OF JAPAN

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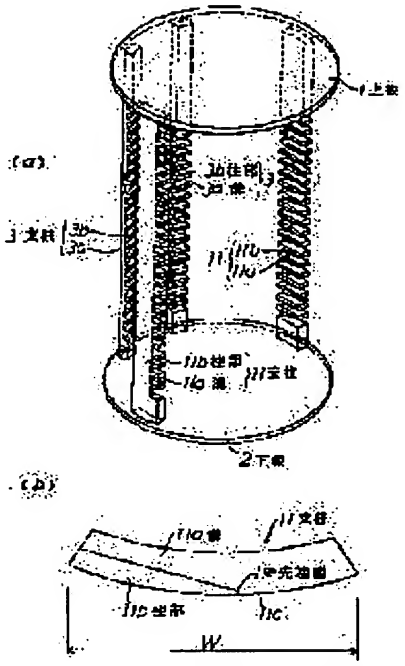
TAKASAGO YUKIO

(54) JIG FOR SEMICONDUCTOR HEAT TREATMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent deformation under high temperature, to have strength corresponding to an automatic carriage system and a large-diameter wafer, and to prevent the generation of slip on the wafer during the heat oxidation and diffusion treatment of the wafer.
SOLUTION: A jig is provided with an upper plate 1, a lower plate 2 and struts 3 and 11 for linking these plates, the wafer is held by a plurality of grooves 3a and 11a provided on the struts 3 and 11 and among the struts 3 and 11, at least the struts 11 for holding both sides are formed wider. Then, the thickness of the wider struts 11 at positions closer to the central parts of pillar parts 11b by 1.0mm from top end faces 11e of the pillar parts 11b is made not thinned than 0.7mm by curring or tilting the top end faces 11e of the pillar parts 11b at an angle more than 45°, notching the sections of pillar parts 11e including the top end faces 11e, or expanding the top end faces 11e of the pillar parts 11b.



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[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

[Claim(s)]
[Claim 1] The fixture for semi-conductor heat treatment characterized by to set thickness in the location of the center-section approach of a pillar section to 0.7 mm or more only 1.0mm from the edge of the pillar section in said double-width stanchion in the fixture for semi-conductor heat treatment which made double width the stanchion which is equipped with the stanchion which connects these with a superior lamella and an inferior lamella, and supports a wafer in two or more slots established in the stanchion, and supports both sides at least among stanchions.
[Claim 2] The fixture for semi-conductor heat treatment according to claim 1 characterized by making the edge of the pillar section in a double-width stanchion become a letter of a curve, or the include angle of 45 degrees or more.
[Claim 3] The fixture for semi-conductor heat treatment according to claim 1 characterized by cutting and lacking a part including the edge of the pillar section in a double-width stanchion.
[Claim 4] The fixture for semi-conductor heat treatment according to claim 1 characterized by making the edge of the pillar section in a double-width stanchion jut out.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the fixture for semi-conductor heat treatment of quality of silicon carbide, such as a wafer boat which is applied to the maintenance fixture of a silicon wafer, especially is used for thermal oxidation, diffusion process, etc.
[0002]
[Description of the Prior Art] In the manufacture process of a semi-conductor, the fixture for semi-conductor heat treatment for holding two or more wafers within an electric furnace is used at the process which diffuses the minute impurities doped to the wafer, and the process which gives an oxide film to a front face. Conventionally, as shown in drawing 5 , this fixture for semi-conductor heat treatment is what connected the superior lamella 1 and the inferior lamella 2 with four stanchions 3, and is a configuration which supports a wafer by two or more slot 3a engraved on these stanchions 3.
[0003] In such a fixture for semi-conductor heat treatment, since a wafer is inserted at a level with slot 3a of a stanchion 3 or is pulled out, it cannot install a stanchion 3 in the front face of a fixture. Therefore, when four stanchions 3 as shown in drawing 5 are narrow-width [same] altogether, it is difficult to support a wafer equally, and the load which acts on a wafer supporter (slot 3a) becomes large. In addition, 3b in drawing 5 shows the pillar section of a stanchion 3.
[0004] Although diameter-ization of macrostomia of a wafer progresses to 8 inches and 12 inches from 6 inches and the self-weight of a wafer is increasing with an advance of a semi-conductor process in recent years, the thickness of a wafer does not increase so much but the problem of a fall on the strength is pointed out. Especially, in high temperature processing 1100 degrees C or more, a slip (crystal defect by the crystal rearrangement) is generated in the supporter of a wafer for the load of this wafer supporter, and it has become the cause of the defect of a semiconductor device.
[0005] On the other hand, the thing using support plates, such as the shape of a ring which supports the periphery of a wafer, is proposed like JP,5-114645,A or JP,6-163440,A as a fixture for semi-conductor heat treatment which controls a slip. However, in the fixture for semi-conductor heat treatment proposed by these, since an excessive support plate is same number-of-sheets [as a wafer] needed, while the weight of a fixture increases and the burden of a thermal treatment equipment originally increases, there is a problem that heat responsibility falls. Moreover, for the thickness of a support plate, the wafer number of sheets which the fixture of the same dimension can also loading support decreases, and the problem of worsening also has productivity.
[0006] Then, it considers as the fixture for semi-conductor heat treatment which can solve both trouble, the stanchion which supports especially both sides as shown in drawing 6 is made into double width, and what distributes the load of a wafer supporter is developed and used increasingly.
[0007]
[Problem(s) to be Solved by the Invention] However, since the edge of pillar section 4b had become a very sharp include angle as shown in drawing 7 , the fixture for semi-conductor heat treatment which has the double-width stanchion 4 as shown in drawing 6 had the problem that a destructive origin came, when this sharp partial 4ba was missing with a chipping etc. when processing slot 4a, or stress acted on a stanchion 4 at the time of heat treatment.
[0008] This invention is made in view of the above-mentioned conventional trouble, does not deform under an elevated temperature, has the reinforcement corresponding to the wafer of an automatic material handling system and the diameter of macrostomia, and aims at offering the fixture for semi-conductor heat treatment which does not generate a slip to a wafer during thermal oxidation and diffusion process of a wafer.

[0009]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, in the fixture for semi-conductor heat treatment of this invention, thickness in the location of the center-section approach of a pillar section is set to 0.7mm or more only 1.0mm from the edge of the pillar section in said double-width stanchion of the fixture for semi-conductor heat treatment which made double width the stanchion which supports both sides at least. And having the reinforcement corresponding to the wafer of the diameter of macrostomia, a wafer is not made to generate a slip during thermal oxidation and diffusion process of a wafer, and the edge of a pillar section is not missing by securing this thickness, with a chipping etc. at the time of recessing.
[0010]
[Embodiment of the Invention] In the fixture for semi-conductor heat treatment which made double width the stanchion which the fixture for semi-conductor heat treatment of this invention is equipped with the stanchion which connects these with a superior lamella and an inferior lamella, and supports a wafer in two or more slots established in the stanchion, and supports both sides at least among stanchions Thickness in the location of the center-section approach of a pillar section is set to 0.7mm or more only 1.0mm from the edge of the pillar section in said double-width stanchion. As the concrete means Make the edge of the pillar section in a double-width stanchion become a letter of a curve, or the include angle of 45 degrees or more, a part including the edge of the pillar section in a double-width stanchion is cut and lacked, and the edge of the pillar section in a double-width stanchion is made to jut out.
[0011] In the fixture for semi-conductor heat treatment of this invention, "only 1.0mm is the location of the center-section approach of a pillar section from the edge of a pillar section" means the location described below.
** As shown in drawing 2 (a) and (c), when the location of 11d where the production of apical surface 11e of pillar section 11b and this apical surface 11e intersects peripheral face 11c of a stanchion 11 is the almost same location, say the location of the center-section approach of pillar section 11b only 1.0mm from the location of 11d on the tangent 12 of peripheral face 11c in said location of 11d.
[0012] ** As shown in drawing 2 (b) and (d), when the locations of 11d where the production of apical surface 11e of pillar section 11b and this apical surface 11e intersects peripheral face 11c of a stanchion 11 differ The line 13 taken down from said apical surface 11e to peripheral face 11c is taken down so that the angles alpha and beta with the tangent 12 in the intersection 14 of this line 13 and peripheral face 11c to make may become the same. The location of the center-section approach of pillar section 11b is said only 1.0mm from said intersection 14 on the tangent 12 of peripheral face 11c in said intersection 14.
[0013] ** As shown in drawing 3 , in agreeing with the line 13 which apical surface 11e of pillar section 11b described above, it says the location of the center-section approach of a pillar section only 1.0mm from this apical surface 11e. In addition, as shown in drawing 4 , in what jutted out the edge of pillar section 11b in the double-width stanchion 11, the location for which it asked by the approach of corresponding of above mentioned **s - **s is said.
[0014] Moreover, in the fixture for semi-conductor heat treatment of this invention, thickness t in the location of the center-section approach of a pillar section is set to 0.7mm or more only 1.0mm from the edge of a pillar section because the edge of a pillar section is missing at the time of the chipping and handling at the time of processing a slot according to the experiment of this invention person, if it is less than 0.7mm. In addition, if the edge of a pillar section is missing, a crack will progress by making the part into a destructive origin, and a result into which the whole stanchion finally breaks will be brought.
[0015] Although it is better as thickness t described above, considering the viewpoint which prevents the chip of the pillar section at the time of processing a slot is large, if thickness t becomes large too much, as for stanchion ******, the weight of the fixture for semi-conductor heat treatment will increase, and the burden of a thermal treatment equipment becomes large, or will cause the fall of heat responsibility, and increase of the temperature distribution by the ununiformity of thermal radiation. Therefore, as for the above mentioned thickness t, it is desirable to be referred to as 10mm or less.
[0016] In addition, in the fixture for semi-conductor heat treatment of this invention, although not limited, since supporting [of a wafer] may become being less than [of the diameter of the wafer which the width of face W of a stanchion 11 supports] 1/5 inadequate and deformation and a slip of a wafer may take place, it is desirable [especially the width of face W of the double-width stanchion 11] to carry out to 1/5 or more. Moreover, if it exceeds one third of the diameters of a wafer, since the burden of a thermal treatment equipment will become large by the increase of weight of a fixture and the fall of heat responsibility and increase of the temperature distribution by the ununiformity of thermal radiation will be caused, it is

desirable to carry out to 1/3 or less.
[0017]
[Example] Hereafter, the fixture for semi-conductor heat treatment of this invention is explained based on the example shown in drawing 1 - drawing 4 . The cross-sectional view of a double-width stanchion whose drawing 1 (a) is the perspective view of the fixture for semi-conductor heat treatment of this invention and whose (b) is the component part of the fixture for semi-conductor heat treatment of this invention, Drawing 2 (a) The important section cross-sectional view of an example where the double-width stanchions whose - (d) is the component part of the fixture for semi-conductor heat treatment of this invention differ, The cross-sectional view of an example where, as for drawing 3 , the double-width stanchions whose (a) - (d) is the component part of the fixture for semi-conductor heat treatment of this invention differ further, drawing 4 (a), and (b) show the cross-sectional view of an example where the double-width stanchions which are the component parts of the fixture for semi-conductor heat treatment of this invention differ further.
[0018] In drawing 1 , the superior lamella of a circle configuration and 2 are the same, 1 is the inferior lamella of a circle configuration, and these superior lamellas 1 and an inferior lamella 2 are connected with four stanchions so that one flank may be opened wide. And among this stanchion, in both sides, the double-width stanchion 11 which has 1/5 or more width of face of the diameter of the wafer to support is arranged, and the narrow-width stanchion 3 is arranged in the center (back).
[0019] To the inner circumference side of said stanchions 3 and 11, as shown in drawing 1 (a), many slots 3a and 11a are formed in the height direction at fixed spacing, and a wafer is supported in these slots 3a and 11a, respectively.
[0020] The fixture for semi-conductor heat treatment of this invention is setting [therefore] thickness t in the location of the center-section approach of pillar section 11b to 0.7mm or more only 1.0mm from the edge of pillar section 11b in the above-mentioned double-width stanchion 11. As are shown in drawing 2 (a) and (b), and apical surface 11e of pillar section 11b in the double-width stanchion 11 is made into the letter of a curve and shown in drawing 2 (c) and (d) As it is made to become 45 degrees or more and the include angle gamma of apical surface 11e of pillar section 11b in the double-width stanchion 11 is shown in drawing 3 It cuts and lacks, and as the part containing 11g of parts into which the tip of pillar section 11b in the double-width stanchion 11 sharpened is shown in drawing 4 , the tip of pillar section 11b in the double-width stanchion 11 is jutted out. In addition, 11f in drawing 4 shows the overhang section.
[0021] By the way, after the above mentioned fixture for semi-conductor heat treatment is formed qualitatively of silicon carbide, for example, fabricates a superior lamella 1, an inferior lamella 2, and stanchions 3 and 11, respectively, it is assembled to the fixture for semi-conductor heat treatment using these each part material, next it carries out sinking-in reaction sintering of the Si into each part material of this fixture for semi-conductor heat treatment. And after doing in this way and carrying out sinking-in reaction sintering of the Si into each part material, the slots 3a and 11a of each struts 3 and 11 are processed, and it makes with a product. This recessing is performed by inserting horizontally the side by which stanchions 3 and 11 were opened wide to a rotary knife, and inserting horizontally so that it may become the same as a locus when that locus inserts the rotary knife of the same outer diameter as said wafer using the rotary knife of an outer diameter smaller than the wafer which it is going to support using the rotary knife of the same outer diameter as the wafer which it is going to support.
[0022] Next, the experimental result which checks the effectiveness of the fixture for semi-conductor heat treatment of above-mentioned this invention and which was performed for accumulating is explained. All the fixtures for semi-conductor heat treatment used for the experiment are manufactured with the nature ingredient of silicon carbide which consists of the silicon carbide 75 weight section and the metal silicon 25 weight section. Into the slot established in the stanchion, respectively, every (20 upper and lower sides are dummies each) 150 sheets, Heat treatment (it is 1200 degrees C and, for 1 hour in a part for /and the first half of 5 degree C, 1 hour of O2 ambient atmosphere and the second half is [a 2 hour heating:temperature up / 8 degree-C a part for /and a temperature fall] N2 ambient atmosphere) predetermined in the condition of having made the 8 inches wafer (thickness of 700 micrometers) supporting was performed.
[0023] The result of an experiment is shown in the following table 1. In addition, the result at the time of using the fixture which installed the double-width stanchion which shows the fixture shown in drawing 5 and the fixture proposed by JP,6-163440,A to drawing 7 as an example of a comparison as a conventional example again is also collectively shown in Table 1.
[0024]
[Table 1]

	治具、広幅支柱の形状	t mm	W mm	スリップ
実施例1	図2（a）	1．5	45	認められず
〃 2	図2（b）	1．5	45	〃
〃 3	図2（c）	1．5	45	〃
〃 4	図2（d）	1．5	45	〃
〃 5	図3（a）	4．0	65	〃
〃 6	図3（b）	3．2	60	〃
〃 7	図3（c）	2．1	65	〃
〃 8	図3（d）	2．8	60	〃
〃 9	図4（a）	1．2	60	〃
〃 10	図4（b）	1．2	65	〃
従来例1	図5	5．0	15	支柱近傍に多数発生
〃 2	特開平6-163440号	5．0	15	認められず（注1）
比較例	図7	0．5	65	実験せず（注2）

(All of the width of face of two narrow-width stanchions arranged to the inner are 15mm.)
Notes 1: While heat responsibility fell by the increase of weight, the support number of sheets of a wafer fell by expansion of slot spacing.
Notes 2: At the time of recessing, a crack occurs and does not experiment at the tip of pillar section 4b.
[0025] When the fixture for semi-conductor heat treatment of this invention was used so that more clearly than Table 1, as for 110 wafers which supported in any case, a slip was not accepted for one sheet, either. On the other hand, in the case of the conventional example 1, much slips generated all of 110 supported wafers near the stanchion. Moreover, although a slip was not accepted for one sheet, either, since the supported wafer was equipped with the ring-like base material, while heat responsibility fell by the increase of weight like the case where the fixture for semi-conductor heat treatment of this invention is used in the case of the conventional example 2, the support number of sheets of a wafer fell to 130 sheets from 150 sheets of this invention by expansion of slot spacing. Moreover, in the case of the example 1 of a comparison, since the crack occurred at the tip of pillar section 4b at the time of recessing, and the crack occurred at the time of the installation in a furnace although the crack was not generated at the tip of pillar section 4b at the time of recessing when it was the example 2 of a comparison, it did not experiment.
[0026]
[Effect of the Invention] As explained above, the fixture for semi-conductor heat treatment of this invention Since thickness in the location of the center-section approach of a pillar section is set to 0.7mm or more only 1.0mm from the edge of the pillar section in said double-width stanchion of the fixture for semi-conductor heat treatment which made double width the stanchion which supports both sides at least Having the reinforcement corresponding to the wafer of the diameter of macrostomia, a wafer is not made to generate a slip during thermal oxidation and diffusion process of a wafer, and the edge of a pillar section is not missing with a chipping etc. at the time of recessing.

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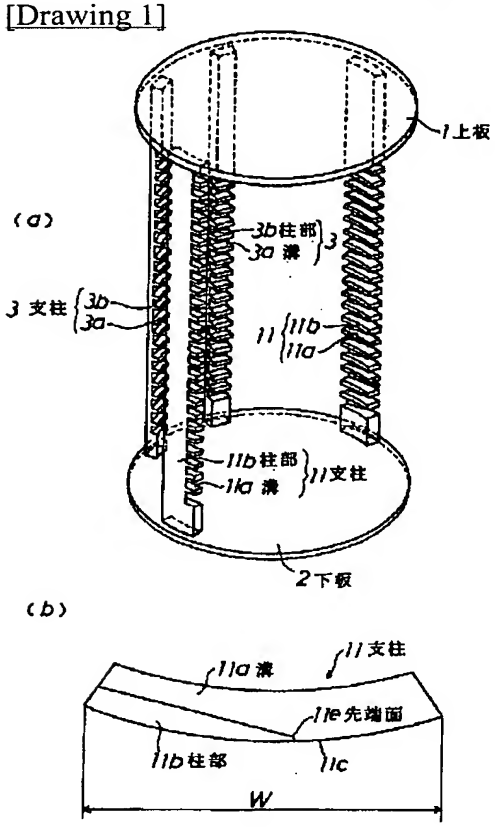
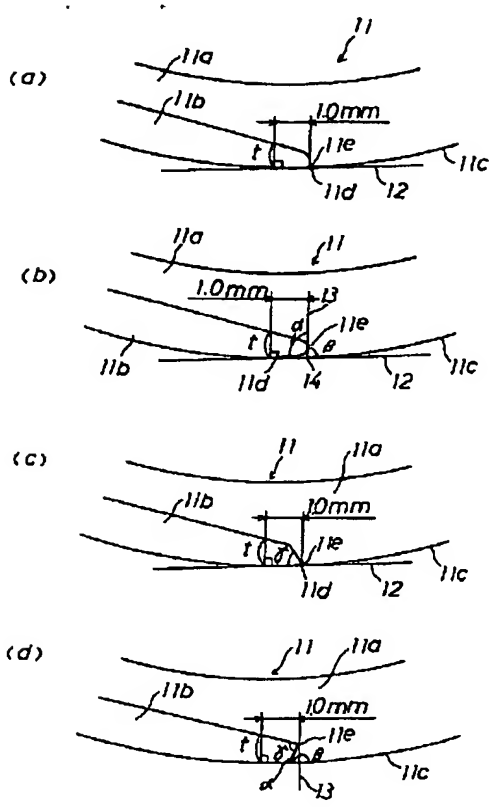
DRAWINGS

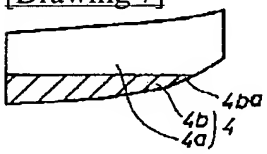
[Drawing 1]



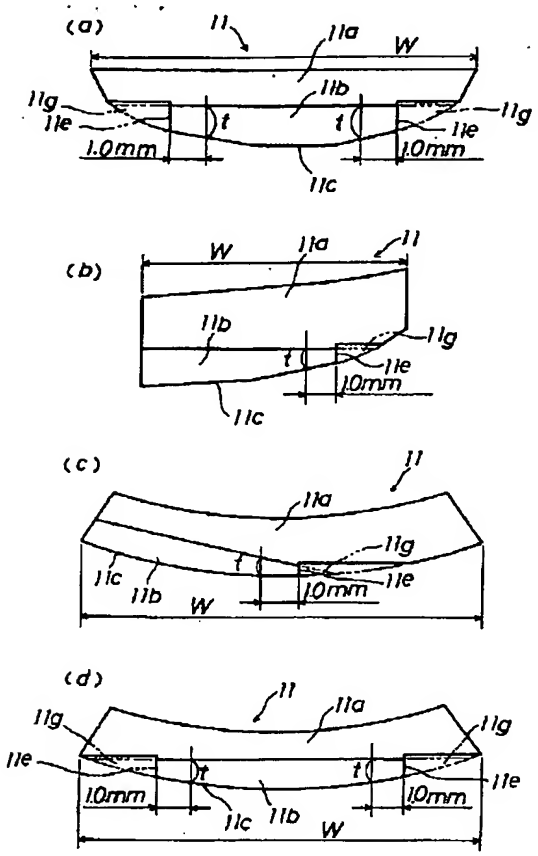
[Drawing 2]



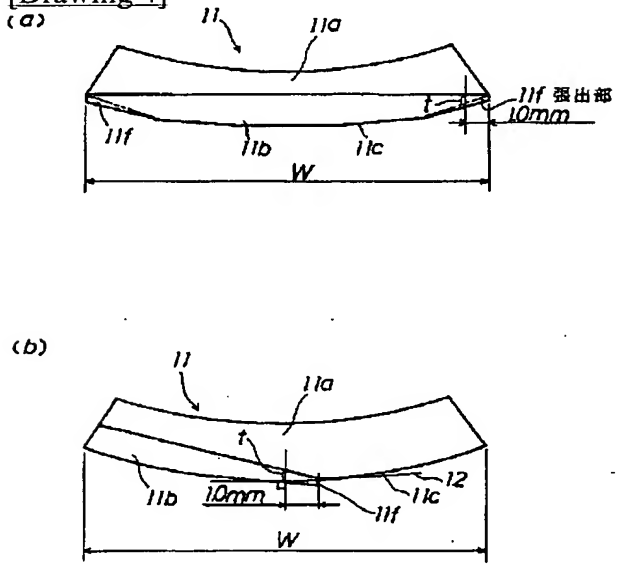
[Drawing 7]



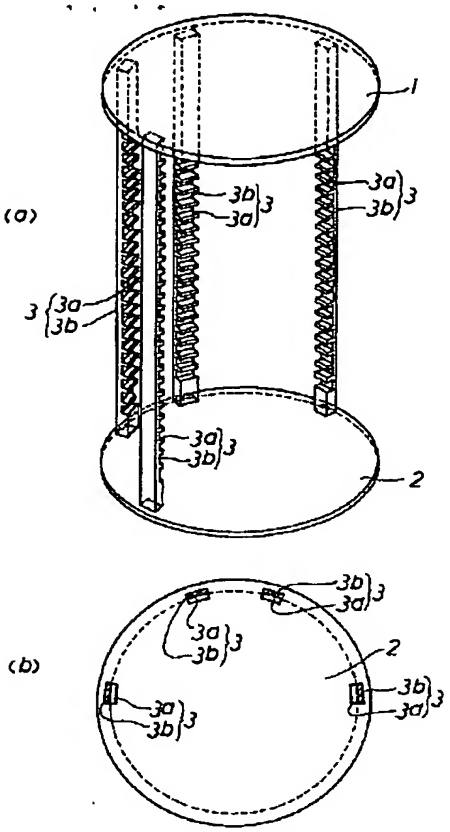
[Drawing 3]



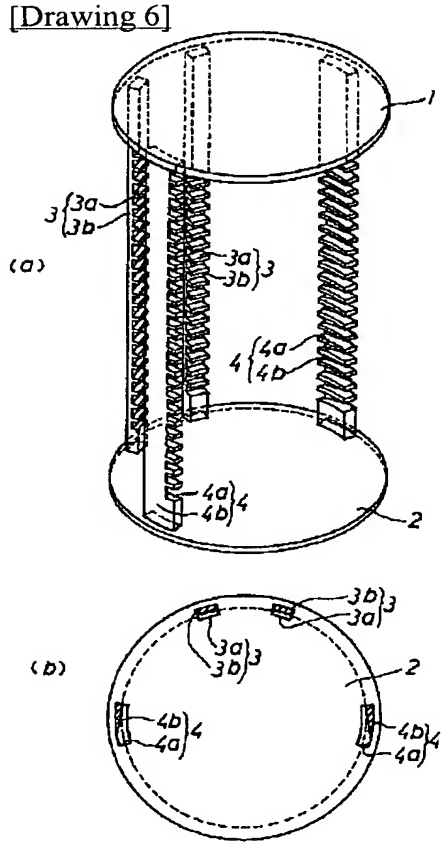
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]